

NORTH⁵⁷

The maritime research newsletter from Lighthouse | No 4, 2009

Heading for global welfare



Report from the first Lighthouse CARGO SHIP theme day

LIGHTHOUSE
N 57° 42.4' E 011° 56.2'

CARGO SHIP

Transport efficiency: a necessity for development and global welfare

Shipping business is about how to carry out seaborne transportation with the highest possible transport efficiency at the lowest possible cost. Today's measure of transport efficiency may however not be tomorrow's, as the sizes and properties of tomorrow's vessel will be different from the current fleet's. Cargo Ship is a Lighthouse theme area focusing on the ship as a cargo carrier. Transport efficiency is the overall driver and sustainable development, global welfare and environmental impact are also considered.

On the 2nd of December, the third Lighthouse theme day was held at Chalmers Campus Lindholmen. The Lighthouse theme days present ongoing research within the five Lighthouse theme areas and provide a forum for discussion of work being done and future research needs and priorities. The theme area in focus this time was Cargo Ship, with research centred on ships as cargo carriers aiming at the highest possible transport efficiency.

Joint research projects study, analyze and develop effective and innovative carrier systems, but also include interaction with ports and other parts of the logistics chain. The research projects focus on systems, seagoing qualities, ship design and engineering, arrangements onboard as well as loading and unloading.

The Cargo Ship day was divided into two sessions: a public seminar in the



Container shipping is crucial for global transportation with respect to global development and welfare.

morning followed by a reference group meeting in the afternoon. The seminar was opened by Olle Rutgersson, head of the Department of Shipping and Marine Technology at Chalmers.

Olle Rutgersson gave an overview presentation of the Lighthouse Maritime Competence Centre and its theme areas. Referring to the Cargo Ship theme day, he reminded the audience of the Swedish pioneering work on RoRo ships, RoPAX ferries, car carriers, HSS ferries and max concept tankers.

Three speakers were invited to present overviews of the work being done within the Cargo Ship theme area and also a more in-depth look at some of the future needs of education, research and product development. Gaute Storhaug from Det Norske Veritas (DnV) in Høvik, Norway, talked about container shipping of today and future challenges.

As a background the trend in economy of scale, container capacity development, global trade and order book of container ships, clearly shows that container shipping plays a very important role with respect to, for example, global transportation, global welfare, global sustainable development and world economy. Many challenges arise from the discussion on climate changes and the growing demand and need for larger vessels. This presentation outlined some examples of technical challenges as well as challenges for more efficient vessel operation and for logistics aspects.

Sustainable development and future actions for protection of the global environment are two examples of Lighthouse core values. Johan Edvardsson, working at Kockums/Thyssen-Krupp Maritime in Karlskrona, talked about composite materials in commercial

University for sustainable are

THE DECEMBER 2ND LIGHTHOUSE CARGO SHIP THEME DAY

Cargo Ship is led by Associate Professor Jonas Ringsberg. Cargo Ship comprises sections of the Ship Design division at the Department of Shipping and Marine Technology at Chalmers University of Technology. Cargo Ship also collaborates closely with the Department of Applied Mechanics and the Department of Mathematical Sciences at Chalmers.

vessels. He summarised the many benefits and the promising future of using composites in parts of a vessel or of manufacturing the entire vessel in composite materials. This group of materials can be considered effective and economic in contrast to metallic materials regarding weight reduction, thermal insulation, use in complex geometries and life-cycle cost. One of the main drivers for using composites, however, is that they may be considered environmentally friendly: weight reduction leads to reduced need for propulsion power and to lower fuel consumption which reduces for instance CO₂ emission, in turn resulting in less impact on the environment.

The third invited speaker, Igor Rychlik from the Department of Mathematical Sciences at Chalmers, presented two projects from the Cargo Ship project portfolio (see Figure). The two projects, CS4 and CS5, are a collaboration between Chalmers and DnV aiming at developing a route planning tool for container ships. The objective of the projects is to design a tool which lowers fatigue damage caused to the ship, reduces fuel consumption (and emissions) and also incorporates ETA (expected time for arrival) in the optimised route plan. Hence, the tool will incorporate the structural characteristics and response of the vessel,

along with wave-height observations and measurements, which are processed using advanced numerical and statistical methods. At the completion of the projects, the aim is to have a tool almost ready for the market that can propose a route plan that may be updated in real time based on current observations of sea-state and structural response.

In addition to the externally invited speakers, four presentations were made by persons from the Department of Shipping and Marine Technology. Björn Södahl talked about Lighthouse's thematic research model which is an interdisciplinary approach to achieve competitive and sustainable shipping. The presentation outlined Cargo Ship's role and contribution in research to resource effective fulfilment of transportation needs: cargo types/customer needs, route conditions and challenges, carrying efficiency, port turnaround and modal transfer.

Jonas Ringsberg, the head of Cargo Ship, presented an outline of the theme area, mission and the project portfolio of nine ongoing and one completed PhD research projects (see Figure). All of the projects except for CS1 are PhD projects which engage one PhD student. A brief presentation of each project was made to show the wide area covered by these



Photo: Jan-Olof Yxell

The Cargo Operations Studio (COS). This educational environment has been designed specifically to mimic real conditions utilising the latest technology and tools for virtual pedagogy.

The Cargo Ship project portfolio

CS1 Cargo operations studio (COS)

(Development project of a virtual simulator)
Contact person: Mr Tomas Olsson-Neptun

CS2 Structural integrity analysis of critical elements of RoPax ships

Head supervisor: Associate Professor Jonas Ringsberg
PhD student: Lic Eng Ulf Karlsson (PhD 2008)

CS3 Hasard/Marine structures

Head supervisor: Associate Professor Jonas Ringsberg
PhD student: Mr Per Hogström

CS4 Ship routing and fatigue analysis of container ships

Head supervisor: Associate Professor Jonas Ringsberg
PhD student: Mr Zhiyuan Li

CS5 Optimisation of ship routing with respect to fatigue and fuel consumption

Supervisors: Associate Professor Jonas Ringsberg and Professor Igor Rychlik
PhD student: Mr Wengang Mao

CS6 Lightweight design using composite structures

Head supervisor: Associate Professor Jonas Ringsberg
PhD student: Mr Måns Håkansson

CS7 Methods for large amplitude ship motions in waves

Head supervisor: Associate Professor Carl-Erik Janson
PhD student: Mr Martin Kjellberg

CS8 Ship manoeuvring in waves

Head supervisor: Associate Professor Carl-Erik Janson
PhD student: Ms Heng Ran

CS9 Hasard/Seakeeping

Head supervisor: Associate Professor Carl-Erik Janson
PhD student: Lic Eng Martin Schreuder

CS10 Requirement management in ship design

Head supervisor: Professor Olle Rutgersson
PhD student: Lic Eng Ingar Malmgren

Finished

Running

ongoing research projects. In addition to transport efficiency, sustainable development, safety and shipping and cargo handling logistics are topics that are naturally incorporated in every project.

Hans Filipsson presented the CS1 project, Cargo Operations Studio, which is a development project of the recently inaugurated virtual simulator for cargo operations and load handling. He illustrated the types of vessels that are part of the studio today and how the studio is operated and used in education. Today it is used in most of the department's education programmes and there are also plans to utilise it in research projects.

The final presenter was Martin Schreuder who presented the CS3 and CS9 projects. These projects deal with

the analysis of damage stability as a consequence of a collision between two ships. The extent of the collision damage is calculated by finite element analysis, which gives input to a damage stability analysis due to flooding. The results from a parametric study on the influence of for instance size and extent of collision damage on length of time from collision to capsizing of the vessel were presented. The results and findings will assist in rule making and increased safety of for instance RoPAX vessels.

In the afternoon, the Cargo Ship reference group continued the day with a brief discussion of the morning's presentations and ongoing research projects.

The research interaction with other theme areas within Lighthouse was also

discussed. The purpose of the meeting was, however, to make an inventory of, and also to foresee, potential future research topics that can be categorized and carried out under the flag of Cargo Ship. The outcome was a number of interesting topics and ideas which will be further developed to full research projects.

The presentations from the Cargo Ship day on the 2nd of December can be downloaded from Lighthouse's public website: **www.lighthouse.nu**. More detailed information about all of the projects can also be found at: www.chalmers.se/smt/EN/research/ship-design.

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Business Ship

Business Ship covers research into the shipping industry's conditions that has long been the centre of attention at the School of Business, Economics and Law at University of Gothenburg. Today there is continuing active research within four areas connected to the shipping business.

Ergo Ship

Ergo Ship comprises sections of the Ship Work Environment and Safety division at the Department of Shipping and Marine Technology at Chalmers University of Technology. Ergo Ship also collaborates closely with the Department of Product and Production Development at Chalmers.

Eco Ship

This theme area is responsible for education and research mainly in the area of ship propulsion, with the particular consideration of environmental effects.

Safe Ship

Safe Ship covers Lighthouse research and development in engineering, organization and education in the areas preventive safety, increased survival and evacuation of damaged ships.

From the director



Photo: Jan-Olof Yvell

Anders Marby
Director Lighthouse

Lighthouse - a light in the darkness...

This is what has been happening since our last newsletter:

- ▶ Yet another theme day with reference group meeting has been held. This time the theme was Cargo Ship. You can find all the presentations given on the theme day at www.lighthouse.nu. The theme days are intended to provide insight into on-going research projects. The reference group meetings give representatives from commerce, academia and civic authorities the opportunity to meet and identify issues and research proposals from within the Lighthouse theme areas.
- ▶ The annual Lighthouse day was held on 21st November 2008. Presentations at www.lighthouse.nu. A special Lighthouse day was held in Stockholm on 3rd March 2009. Presentations at www.lighthouse.nu.

▶ Coming events

- Theme day Business Ship 7th April 2009
- Theme day Safe Ship 21st April 2009

To read more about coming events and current projects in Business Ship, Cargo Ship, Eco Ship, Ergo Ship and Safe Ship go to www.lighthouse.nu where you will find all the latest Lighthouse news and background information.

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